

ILLINOIS STATE WATER SURVEY

REPORT ON

EXISTING WATER WORKS AT FAIRBURY

August 13, 1914

Paul Hansen, Engineer.

J. F. Schnellbach, Engineering Assistant.



FAIRBURY WATER WORKS

May, 1914

EXISTING WATER WORKS AT FAIRBURY

J. F. Schnellbach, Engineering Assistant.

In accordance with instructions Fairbury was visited May 15, 1914, for the purpose of gathering information concerning the public water supply. Assistance was rendered by Mr. P. H. Taylor, Mayor; Mr. T. D. Karnes, city clerk and Mr. T. W. Burns, engineer of the water works.

GENERAL CONSIDERATIONS

Fairbury is located in the south-central part of Livingston county on the watershed of the Illinois-Vermilion river.

The populations as taken from the census report have been as follows:

<u>Year</u>	<u>Population</u>	<u>% Change</u>
1890	2324	---
1900	2187	5.9 decrease
1910	2505	12.5 increase

The city is in a prosperous farming community and its older citizens are largely retired farmers. More than a moderate growth of population in the near future is not likely.

Transportation facilities are provided by the T.P. & W. and the Wabash railroads.

The corporation includes about 1 sq. mi. of slightly rolling land, with a high point near the center of town.

Leverett's "Illinois Glacial Lobe" states that rock is entered in the vicinity of Fairbury at depths of from 50 to 90 feet. At a depth of 100 to 150 feet a vein of coal is entered. Private wells in this territory obtain water at depths of 18 to 55 feet, from a sand and gravel stratum. There are a great many of these wells in use. In the accompanying table analyses of some of these are given.

The city has about 1800 feet of brick paving and cement sidewalks reach all the built up portions.

Fairbury has no sewerage system, but is quite completely served with drain tile. It is supposed that sanitary sewage does not enter this system, but the discharge at the outlets show evidences of house hold wastes.

The city is naturally divided so that there are three distinct drainage districts and the drainage system has three main outlets, one to the south, one southeast and one northeast, all emptying into Indian creek. The creek flows along the southern and eastern corporation lines and has a watershed of about 50 sq. mi. There is usually a small flow in the stream but in extremely dry weather it becomes dry. The creek flows through rich farm land; grain fields adjoin its banks for many miles up stream. There are no houses within 500 feet of the creek between Fairbury and its junction with the south branch of the Vermilion river, about two miles north.

Plans have been prepared by Mr. A. H. Bell, County Surveyor of McLean county, for an additional mile of sewers and a change in the south outlet moving it about 500 feet west of its present location. The change affords an outlet about 8 feet lower than the present one. Vitrified tile will be used throughout as it is expected to make house connections to the sewers in the near future. When household wastes are discharged into the system some sort of purification will probably be necessary.

It is unlikely that the sewer project will receive immediate attention as bonds have not been voted and have been defeated once in an election in 1913.

Almost every house has a cesspool and privies are in general use.

Vital statistics are not kept, but it was stated by the local authorities that there has been no typhoid fever for a number of years.

INSTALLATION AND DEVELOPMENT OF WATER WORKS

The system of water works at Fairbury is owned by the city and was installed about 1887. At this time an open well was dug 25 feet deep and 25 feet in diameter, a wooden elevated tank and tower were erected and about 3300 feet of 8-inch mains laid. Water was pumped with a Smith-Vale steam pump to the distribution system and tank.

In 1892 the dug well was abandoned, because of a desire to obtain a deep well water, and a well was drilled

2000 feet in depth. At that time the present pumping station was built and the pumping machinery now used installed.

Two collecting reservoirs were built in 1898.

The old elevated tank served until 1899 when a new wooden tank was built on a brick tower. In 1913 this tank was replaced by one of steel construction. Along with these developments several additional have been made to the the mains.

SOURCE OF SUPPLY

The city owns a plot of ground 150' X 350' about 2 blocks west of the business center and on it the pumping station and well are located. The well is drilled to a depth of 2000 feet. This is cased to a depth of 394 feet with 8-inch standard iron pipe. A very salty water bearing stratum is entered at a depth of 1500 feet which is shut out by 60 feet of 6-inch casing. A log of the well could not be obtained and it is not known at what depth the fresh water enters.

Water rises to a level about 80 feet below the ground surface and the working barrel of the deep well pump with which the well is equipped is placed at a depth of 252 feet.

It is not known to what extent pumping affects the water level in this stratum, and no very reliable tests have ever been made on the well. It is understood that there has always been plenty of water to meet the de-

mand.

Water is discharged by the well pump into a 10,000 gallon rectangular reservoir located just inside the pumping station. It is a concrete structure 20' X 9' X 7-1/2' with a flat concrete top about 2-1/2 feet above the floor of the station. This basin is connected by a 4-inch pipe located about 2 feet above the bottom with a 63,500-gallon reservoir located just outside the pumping station, so that the two basins actually constitute one storage reservoir. The latter basin is 30 feet in diameter and 12 feet deep. Its walls are built of brick with a concrete plaster both inside and out and is covered with a conical shingle roof. The walls rise about 2 feet higher than the surrounding land and earth is mounded up to within 6 inches of the top. Surface drainage is away from both the reservoirs, there are no privies or cesspools in the immediate vicinity and likelihood of contamination gaining entrance appears remote.

From the collecting reservoir water is pumped into the mains and an elevated tank. The basins are cleaned about once a year, when there is removed a fine white sediment, which immediately after being stirred up is said to become inky black.

At the present time there is some agitation for the drilling of a second well. Such an improvement is greatly to be desired for fire protection, for if a serious accident should happen to the pump in the present well, the city would be left without a water supply.

CONSUMPTION OF WATER

Pumping records are not kept and no very reliable estimate of the daily consumption is at hand. Judging from the capacity of the pumps and the number of hours operated daily a pumpage of about 400,000 gallons per day seems likely. From this estimate the following rates are computed:

Average daily per capita----- 157 gals.

" " " service----- 800 "

About 3/4 of the services in Fairbury are metered. It is understood that there are several leaks in the mains. A number have been discovered during the past year.

QUALITY OF WATER

An accompanying tabulation contains a number of analyses of the public water supply. These have generally indicated a water of good sanitary quality.

The water forms only a soft scale or sludge when used in boilers and is comparatively good for boiler uses. It is looked on locally as a very good water. The analyses give traces of iron, but there are said to have been no complaints resulting from it. A faint odor of hydrogen sulfide is given off when the water is first drawn from the well, but disappears on standing.

PUMPING STATION AND MACHINERY

The pumping station is a small brick building located in the western part of town. The well is located inside the station. It is equipped with a 12 X 36 American steam head deep well pump with 6-inch discharge, rated at about 710,000 gallons per day. Water is pumped from the reservoirs into the distribution system and tank by a Dean duplex crank and flywell steam pump, with an ordinary service rate of about 720,000 gallons per day, and a fire rate of 900,000 gallons per day. This is a 14 X 8 X 12 pump with a 7-inch suction and a 6-inch discharge. There is held in reserve for fire purposes a Fairbanks-Morse 10 X 6 X 10 duplex steam pump, with a 4-inch suction and a 3-inch discharge and a rated daily capacity of 225,000 gallons.

The boiler plant consists of two Atlas fire tube boilers, 48 inches in diameter and 16 feet long, each of 50 H.P. capacity.

A steam pressure of 125 pounds is carried.

DISTRIBUTION SYSTEM

The system of mains is made up of approximately 4.7 miles of cast iron pipe ranging in size from 4 to 8 inches. Of this, there are about 9680 feet of 4-inch. There are 26 valves and 14 dead ends. There are 58 Mathew double fire hydrants or about 12.3 per mile of mains. The service connections number 495, about 75 per cent. of which

are supplied with meters.

A water tower 110 feet high is connected with the distribution system. It consists of a brick support 85 feet high on which is placed a steel tank of 58,000 gallons capacity, 25 feet high and 20 feet in diameter.

The water tower provides a pressure of about 48 pounds at its base. Pressures in the distribution system do not vary much; probably averaging between 45 and 48 pounds. For fire purposes direct pumping is established and a pressure of about 80 pounds provided.

FINANCIAL

Water users who do not have meters are charged \$4.00 per year for those places where there is only one faucet and \$1.00 per year for each additional faucet. Those having meters are charged a minimum rate of \$1.00 quarter which allows the use of 3000 gallons. All water used in excess of 3000 gallons is charged for on a sliding scale rate varying from 15 cents to 30 cents per 1000 gallons. The city owns and installs the meter.

The original bond issue for water works purposes was \$16,500. Later additions have brought the cost of the water works up to about \$40,000.

The water works engineer stated that the revenue from the sale of water during the past year amounted to \$3400 and the cost of operation including the installation of meters and other repairs amounted to \$3500. The water

rents generally cover the cost of operation.

Respectfully submitted,

J. F. Schnellbach

Engineering Assistant.

August 12, 1914

R

MINERAL ANALYSES OF FAIRBURY

Date	April 12, 1908.	Nov. 13, 1911.
Source - drilled wells	2000'	2000'
Laboratory No.	17317	22659

IONS		Pts. per mil.	Grs. per gal.	Pts. per mil.	Grs. per gal.
Potassium	K	---		13.3	
Sodium	Na	445.6		432.1	
Ammonium	NH ₄	1.2		1.2	
Magnesium	Mg	17.3		14.6	
Calcium	Ca	17.7		42.0	
Iron	Fe	---		trace	
Aluminium	Al	6.2		"	
Nitrites	NO ₂	0		---	
Nitrates	NO ₃	1.4		.2	
Chlorine	Cl	54.5		49.0	
Sulfate	SO ₄	66.		69.2	
Silica	SiO ₂	22.5		12.0	
Bases	---	1.0		.5	

HYPOTHETICAL COMBINATIONS

Potassium Nitrate	KNO ₃	---	---	.3	.02
Potassium Chloride	KCl	---	---	25.2	1.47
Sodium Nitrate	NaNO ₃	1.9	.11	---	---
Sodium Chloride	NaCl	899.4	52.46	788.8	46.01
Sodium Sulfate	Na ₂ SO ₄	97.7	5.70	102.4	5.97
Sodium Carbonate	NaCO ₃	135.8	7.92	202.8	11.83
Ammonium Carbonate	(NH ₄) ₂ CO ₃	3.2	.19	6.4	.37
Magnesium Carbonate	MgCO ₃	59.9	3.49	50.6	2.95
Calcium Carbonate	CaCO ₃	44.2	2.58	104.8	6.12
Iron Oxide	Fe ₂ O ₃	---	---	trace	trace
Alumina	Al ₂ O ₃	6.2	.36	"	"
Silica	SiO ₂	22.5	1.31	12.0	.70
Bases	---	1.0	.06	.5	.03
Total	-----	1271.8	74.18	1293.8	75.45

Fallacy Analyses.

Date	Lab.	Total	Color	Res.	Cl.	O	Nitrogen			Bacteria			Gas			Total	Source
							Free	NH ₃	NH ₄	Am.	Am.	NH ₃	NH ₄	Gel.	Agar	10	10
5/23/4	27582	2	0	2d	1280	500	3.1	1.0	0	0.2	320	9	1	144	24	5	City Supply Well 200'
5/23/4	27581	10	0	2d	1225	570	2.4	1.28	0	0.6	320	20	9	1-2	24	5	"
5/24/4	22464	20	Blue H ₂ O	1280	480	6.8	2.65	0.24	0	0	320	2	14	1.8	24	5	"
5/24/4	22462	3	"	1V	1200	470	4	6.72	0.56	0	320	36	14	1.7	24	5	"
5/24/4	22463	0	"	0	1202	490	3.8	9.2	0.4	0	320	700	1.2	1.2	24	5	"
5/26/4	20226	10	3d	0	1249	520	4.0	1.88	0.64	0	112	326	13	1-2	24	5	"
5/26/4	19237	0	0	4.5	1288	520	1.9	9.6	0.4	0	324	322	152	1.2	1.2	5	"
5/26/4	17419	0	0	0	1316	500	3.9	1.88	0.24	0	180	348	6	1-2	24	5	"
5/16/4	17418	20	10	16.5	1343	550	2.0	8.85	0.06	0	346	2	1-2	24	5	"	
5/22/4	17317	10	2	0	1315	545	5.8	9.2	0.4	0	332	328	340	1-2	24	5	"
5/24/4	17076	5	0	0	1320	545	6.3	0.4	4.0	0	330	-	-	1-2	24	5	"
5/26/4	16364	0	0	14949	12745	5535	2.7	2.96	0.6	0.04	311	321	30	-	-	5	"
5/27/4	27224	5	0	10	343	13	1.7	0.24	0.4	0.01	108	274	150	9.5	1-2	24	-
5/27/4	26523	0	0	0	323	4	1.0	0.36	0.06	0	344	312	1500	180	1-2	24	-
5/27/4	23587	0	0	0	2448	490	3.3	0.06	0.72	0	26.0	442	400	270	1-2	24	-
5/28/4	20207	0	0	0	1079	520	2.0	0.18	0.078	0	712	265	2600	14	24	34	5
5/26/4	20068	5	0	Night	3272	58	1.4	0.24	1.6	1	519	524	2000	14	24	24	5
5/28/4	19395	0	0	0	862	49	1.0	0.58	1.62	0.07	20.0	243	610	1.2	24	34	5
5/29/4	19394	5	5	0	836	150	1.6	0.59	1.26	1.40	11.2	315	77000	14	24	24	5
5/31/4	19722	0	10	0	1761	116	1.6	0.92	1.14	0.06	220	420	3600	1-2	24	24	5
5/31/4	15770	3	5	0	367	63	1.9	2.8	0.58	0.92	11.9	258	3000	1-2	24	24	5
5/31/4	18749	3	20	0	458	17	2.0	0.4	0.72	0.06	274	392	380	1-2	24	24	5
5/31/4	18241	0	0	630	71	1.3	0.88	0.62	0	72	287	240	14	1.2	24	5	"
5/31/4	15236	0	0	1114	77	11	0.04	1.24	0.04	0.04	306	1600	14	1.2	24	5	"
5/4/4	19417	0	0	1140	375	3.2	0.02	0.52	0.01	11.0	412	640	1.2	1.2	24	5	"
5/7/4	17369	0	0	536	63	1.8	0.26	0.72	0	72	262	100	14	1.2	24	5	"
5/6/4	16499	80	6	0	1052	57	2.4	2.0	0.24	0	0.08	372	-	1-2	24	5	"